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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/497,865	02/04/2000	Donald C. D. Chang	PD-980034	7997

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EXAMINER

ISSING, GREGORY C

ART UNIT	PAPER NUMBER
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3662

DATE MAILED: 02/01/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/497,865

Applicant(s)

CHANG ET AL.

Examiner

Gregory C. Issing

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 October 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-37 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 4-9, 11, 13-18, 21-22 and 25-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over either one of Richards et al or Karlsson et al in view of either one of Chiba et al or Suzuki et al and further in view of Chang et al.

Each of Richards et al and Karlsson et al teach the use of a satellite terminal antenna that combines mechanical scanning in the azimuth direction and electronic one-dimensional scanning in the elevation direction wherein the antenna is rotated mechanically such that multiple satellites are within the elevation scanning plane of the antenna. Multiple beams are taught and shown for the purpose of simultaneously tracking the multiple satellites for providing soft handover. Each of Richards et al and Karlsson et al differ from the claimed subject matter since the claimed digital beam former is not specified; Richards et al describe the use of an active electronically scanned array without specifying the use of analog or digital processing/beamforming, while Karlsson et al merely describe a phased array antenna. The progress in digital device technologies has led to the use of DBF antennas for use in commercial communication system, most suitably, mobile radio systems, as taught by Chiba et al (see "Introduction", e.g.) and Suzuki et al (see "I. Introduction" and "III. Digital Beam Forming Antennas", e.g.). The advantageous features of DBF for use in phased array antennas as a replacement for analog

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beamforming are clearly identified therein. Chang et al describe a digital beam forming technique that is efficient and utilizes fewer ADCs than conventional digital beam formers, resulting in lower power requirements, weight, complexity and cost; Figure 2 exemplifies the technique, including the claimed “multiplexor” 180, “analog to digital converter” 198, and “circuitry for forming multiple digital beam forms” 130. A digital receiver is inherent.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify either one of Richards et al or Karlsson et al by using/substituting a digital beam former for the electronically scanned antenna beams in view of the progress in such direction in the art as shown by either one of Chiba et al or Suzuki et al for the reasons set forth above. Moreover, it would have been further obvious to one having ordinary skill in the art to modify the digital beam former by using the DBF technique expressed by Chang et al so as to provide a lightweight and less costly device for a user terminal.

The applicants previously argued the failure of the prior art to show the claimed use with an equatorial satellite constellation, the formation of multiple beams so that the antenna connects with a second satellite prior to breaking with first satellite, the mechanical scan in azimuth and an electronic one-dimensional scan in elevation and the alignment of the major axis of the antenna with the incoming signal. However, each of Richards et al and Karlsson et al contemplate use with communication satellites; this incorporates all communication satellites. While Karlsson et al emphasize use with LEO, use with GEO and MEO satellites is possible since the LEOs move much more rapidly and require more stringent controls. However, if the antenna is capable of maintaining communication with LEOs, the maintaining of communication with MEOs and GEOs are easier since their apparent movement is to a lesser degree. Thus,

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applicants' argument is not convincing. Each of Richards et al and Karlsson et al clearly disclose multiple beams for providing soft handover between satellites, thus, applicants' argument is contrary to the teachings in the prior art. Each of Richards et al and Karlsson et al clearly disclose mechanically rotating the array in azimuth and electronically scanning in one dimension in elevation, thus, the applicants' argument is not convincing.

3. Claims 2, 3, 10, 12, 19, 20 and 23-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combined prior art set forth above as applied to claims above, and further in view of Ajioka and Barrett et al.

Either one of (Richards et al or Karlsson et al) in view of either one of (Chiba et al or Suzuki et al) and Chang et al teach a satellite communication terminal having mechanical azimuthal scanning and electronic elevational scanning using digital beam forming techniques that allow for soft handover. The combined prior art fails to specify the electronically scanned antenna array as comprising cross-slotted waveguides, each including a septum. Ajioka teach the conventionality of a cross slotted waveguide having a septum for use in a phased array antenna. Barrett et al teach the conventionality of a slotted antenna array for use in a satellite communication terminal wherein azimuthal scanning can be achieved mechanically and elevational scanning can be achieved electronically. In view of the conventionality of cross slotted waveguides in scanning antenna arrays as shown by each of Ajioka and Barrett et al, it would have been obvious to one having ordinary skill in the art to modify the scanning antenna arrays of either one of Richards et al or Karlsson et al by substituting a cross-slotted waveguide array. Ajioka further shows the use of a septum for controlling characteristics of the antenna output.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 7-12 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 7 is not sufficiently disclosed with respect to the use of “a plurality of multiplexer devices . . . each in communication with one of said . . . elements”; additionally, this is not shown in any of the drawings.

6. Claims 1-37 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1, 7, 21, and 37, the language an “antenna (terminal) for a(n) . . . constellation” fails to make clear the use of the device in a satellite communication system. Rather, the language appears to define that the antenna is for the satellites in the constellation. In claim 1, the language “**forming** multiple digital beam **forms**” and “**converting** said digital beam **forms**” are not clearly written; the cancellation of the terminology “forms” is suggested to be cancelled.

Claim 6 is not clearly written; it is unclear if this claim is further limiting or merely restates that which is already in the claim. With respect to language of the claims that actually performs beamforming, the recitation of “radiation elements” that form beams is confusing and not clearly claimed.

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In claim 7, the language “**forming** digital beam **forms**” is unclear for reasons similar to that set forth above.

In claim 13, the language “**forming** multiple beam **forms**” and “**transmitting** said multiple beam **forms**” is unclear for reasons previously set forth.

In claims 14-16, the language “**forming** (to **form**) (**processing**) multiple beam **forms**” is unclear for reasons previously set forth.

In claim 21, the language “for electrically scanning” is incorrect. The antenna is “electronically scanned”.

In claim 30, “**forming** (**transmitting**) multiple beam **forms**” is unclear for reasons previously set forth.

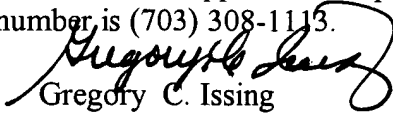
7. The disclosure is objected to because of the following informalities: on page 8, aperture 24 is described but not shown in the drawings.

Appropriate correction is required.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory C. Issing whose telephone number is (703)-306-4156. The examiner can normally be reached on Mon-Thurs 6:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thomas Tarcza can be reached on (703)-306-4171. The fax phone numbers for the organization where this application or proceeding is assigned are (703)-305-7687 for regular communications and (703) 305-7687 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1113.


Gregory C. Issing
Primary Examiner
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gci
January 29, 2002